

Do cooperative learning and family involvement improve variables linked to academic performance?

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Abstract

Background: One of the most serious problems in the Spanish education system is the high percentage of school failure in Compulsory Secondary Education. The aim of this study is to analyze the influence of a socio-educational program based on cooperative learning and family involvement on a series of variables related to academic performance, paying particular attention to the differences between retained and non-retained students.

Methodology: A two-group quasi-experimental design incorporating pre-testing and post-testing was used. The study involved 146 students in the experimental group and 123 in the control group, 8 teachers, and 89 parents or other family members. **Results:** The program was observed to have a positive effect on self-image, study habits, satisfaction with the subject, maternal support and control, and opinions about the school. In addition, the results for non-retained students are better. **Conclusion:** Cooperative work and family involvement in education affect the variables which research links to improving school performance.

Keywords: Self-image, parental support and control, study habits, satisfaction, opinions about the school.

Resumen

¿Mejoran el aprendizaje cooperativo y la implicación familiar las variables vinculadas al rendimiento académico? Antecedentes: en el sistema educativo español, uno de los problemas más graves detectados es el alto porcentaje de fracaso escolar en la Educación Secundaria Obligatoria. El objetivo de este estudio es analizar la influencia de un programa socioeducativo basado en el aprendizaje cooperativo y la implicación familiar en una serie de variables relacionadas con el rendimiento académico, prestando especial atención a las diferencias entre estudiantes repetidores y no repetidores. **Metodología:** utilizamos un diseño cuasi-experimental de dos grupos con pretest y postest. En la investigación participaron 146 estudiantes en el grupo experimental y 123 en el grupo de control, 8 docentes y 89 padres, madres, u otros miembros de la familia. **Resultados:** se observa que el programa tiene un efecto positivo en autoimagen, hábitos de estudio, satisfacción con la materia, apoyo y control materno, y opiniones sobre la escuela. Además, los resultados son mejores para los estudiantes no repetidores. **Conclusión:** el trabajo cooperativo y la implicación familiar en la educación inciden sobre variables que la investigación vincula a la mejora del rendimiento escolar.

Palabras clave: autoimagen, apoyo y control parental, hábitos de estudio, satisfacción, opiniones sobre la escuela.

In recent years, principally starting from the international assessment studies of key competencies (PISA), there has been much discussion about the academic performance of Spanish students when compared with others. PISA data in our country should be interpreted in the context of retention, which is most clearly significant throughout Compulsory Secondary Education (12.5% for first-year students, 11.1% for second-year students, 11.3% for third-year students, and 9.5% for fourth-year students) (Ministry of Education, Culture, & Sports, 2016), as it is a burden for the future of many students who end up dropping out of the education system. Marcenaro and Navarro (2011) presented the retained students' status as a clearly differentiating variable

regarding students' level of academic performance, noting that failure is part of a trend within this population subgroup. These authors observed that the average quality attained in assessment tests improved as parents' educational level increased –around 5% more from one level to the next–, although these differences disappeared when focusing on retained students. This negative effect of retention should be cause for reflection on the usefulness of such a measure (OECD, 2016).

Given these discouraging statistics, the focus should be on the factors that determine academic performance, so that their analysis can give rise to expanded possibilities for intervention (Barbero, Holgado, Vila, & Chacón, 2007; Creemers & Kyriakides, 2008; Winne & Nesbit, 2010). Social research argues that performance is influenced by the circumstances in which learning takes place (Suárez et al., 2011). In addition, Calero, Choi, and Waisgrais (2010), taking as reference PISA data obtained in 2006, analyzed the variables which determine the position of a student in the group at risk of failing school. Specifically, they studied individual factors such as gender or retention; family factors, including social and

economic status, parents' employment status or educational level, the immigrant family's country of origin or the language spoken at home; or school variables, such as school characteristics, resources, educational processes or composition of the student body (Santos Rego, Godás, & Lorenzo, 2012). Cordero, Crespo, and Pedraja (2013), also based on the PISA data, concluded that inequalities in educational outcomes would more likely be attributed to the students' characteristics than to the schools where they studied and that this difference was more marked in Spain (Cordero, Manchón, & Simancas, 2014; Núñez, Vallejo, Rosário, Tuero, & Valle, 2014).

At present, research on the determining factors of academic performance continues to seek evidence in the environment of the dynamics that reflect student's personal reasons, the weight of social and economic status of the families that support them, and a number of contextual determinants.

In this regard, it is important to take into account studies on the relationship between students' motivation and retention, and how this circumstance might affect academic performance, students' engagement level and, in worst cases, the decision to drop out of school (Cham, Hughes, West, & Im, 2015; Roderick, 1994; Shernoff, 2013). This could lead to the association of such research with works that focus more on the study of the motivational profiles of this type of students, while not losing sight of the influence of self-efficacy patterns (Komarragu & Naddler, 2013).

The present work pursues a line has been previously studied among different populations and with other variables, at both individual and contextual levels (Barbero et al., 2007; Covington, 2000; Dufur, Parcel, & Troutman, 2013; Núñez et al., 2014; Santos Rego, 2012; Valle et al., 2009). These works found that the highest average academic performance –in terms of specific grades– is based on student's personal characteristics, motivational variables, family support and control and relationships with friends. All of them, with uneven influential weight, determine the best or worst academic performance.

The structure of the model on which this study is based (Creemers & Kyriakides, 2008) establishes for the contextual level an analysis of national or regional educational policies and their assessment. For the school level there is analysis and assessment of both the educational project of each school and its planning regarding the learning environment. For the classroom level, an analysis is carried out regarding the faculty's position when pointing out goals for specific contents to be explained, the structure of materials, techniques used to encourage discussion, strategies to solve the designed activities and the opportunities to implement or apply the explained contents. Finally, with respect to the student level, a number of factors are proposed, the so-called stable factors over time, which emerge from a social and cultural perspective, and a psychological view that includes skills, perseverance and variables related to specific tasks.

Using this approach, a program for improving education performance was designed, implemented and assessed in seven secondary education schools, involving students, teachers and families. Thus, the current study is aimed at analyzing the impact of this program on a set of variables that can improve the performance of the students. Two working hypotheses are proposed:

- The ECO-FA-SE program will improve students' self-image, their satisfaction with the subject where it is applied, their opinion about the school where they study, their study habits, and they will receive greater support from their families.

- The results of the program implementation will be better in the retained students.

Based on previous studies (Santos Rego, 2012), the research team designed a social and educational program, called ECO-FA-SE, to improve the educational performance of CSE students (Santos Rego, 2014a). The program consists of three parts:

1. Cooperative learning program. The available data support the conclusion that the structures of cooperative interaction, provide greater cognitive-affective profitability than the individualistic and competitive structures (Gillies, 2014). Johnson and Johnson (2014) grouped their effects into three major categories: achievement, positive interpersonal relationships, and psychological adjustment. Thus, students improve their school performance, by developing their autonomy and increasing their motivation and persistence on a task, as well as their levels of self-esteem, self-efficacy, and responsibility (Johnson, Johnson, Roseth, & Seob, 2014). This is aimed at working cooperatively in the classroom context in order to favor students' different abilities and skills. Its development was led by teachers of mathematics, natural sciences, galician language and literature, and spanish language and literature, who had previously been trained in different techniques of cooperative learning. Teachers had to work with the chosen technique for at least a month and a half.
2. Family education program. The research study showed the association between mothers' and fathers' participation in schools and their children's academic performance, by increasing their social capital and control (Epstein, 2011; Fan & Chen, 2001; Grant & Ray, 2013; Jeynes, 2011). Parents who show more commitment to school raise their social capital because they have more opportunity to interact and learn from other parents and teachers about school procedures, and tend to take note of how to optimize home schooling or how to manage complicated situations (Ryan, Casas, Kelly-Vance, Ryalls, & Nero, 2010). This program includes two sub-programs with five working sessions of two hours each. The first, devoted to adolescents' families, is aimed at advising them on how to provide help and support to their children on their educational path, communicating to them the importance of sharing their expectations and future plans. The second sub-program focused on students' habits and study techniques. This program was carried out outside school hours and was implemented by members of the research team with the help of school professionals.
3. Service-Learning program. This methodology helps students to show more interest in the study, promoting improvements in the practical use of knowledge, synthesis of information, summary of main ideas, or reflection on different perspectives on a problem. In any case, this program, optional for schools, did not affect the results presented.

Method

Participants

Seven schools participated –6 public schools and 1 subsidized-private school–, as well as a total of 146 CSE –first and second

year— students in the experimental group (51.4% boys and 48.6% girls), of whom 27.4% were retained at least once, and 123 in the control group (54.5% boys and 45.5% girls), with 23.6% retained students; 8 teachers (in one of the schools there were two experimental groups); and 89 fathers, mothers, or other family members (grandmothers). Students are not older than fourteen years old, $M = 13.46$ (.93); with an age range between 12 and 17 years, $M_{\text{exp}} = 13.53$ (.98), $M_{\text{con}} = 13.37$ (.87). Foreign-born students account for 19.9% in the experimental group, and 18.7% in the control group.

Instruments

The students were administered a pre-test and post-test scale, consisting of 9 questions on personal and educational background – including retention–, 3 questions on the subject in which we worked with cooperative learning, three dichotomous questions on permanent schedules and place of study and various subscales with a Likert response format: Self-image scale as a student (23 items with five options ranging from *strongly disagree* to *strongly agree*); scale of opinions on the school (9 items with the same five alternatives); satisfaction with the subject (3 items with the same five alternatives); support and control activities carried out by fathers, mothers, or other family members, made up, for each of the members, of 9 items with five response alternatives (ranging from *never* to *always*); and scale of study habits (10 items with a format of the same five response alternatives). In the post-test phase, a new subscale was added on the cooperative work in the classroom (10 items and four response alternatives ranging from *strongly disagree* to *strongly agree*).

The instrument was designed by the research team and validated in a previous research study (Santos Rego, 2014b). Implementation took place collectively in the classroom, using tutors of each group specially trained.

First, the factorial exploratory analyses were performed with the used scales and it was found that, except for the self-image scale, which reported four factors (companionship, feedback, self-esteem, and self-efficacy), the rest of them reported only one. Pre and post-test reliability indices are shown in Table 1.

As observed, the reliability indices recorded at the two points in the study are suitable for each of the subscales. One might think that the score obtained in study habits is low; however, it should be clarified that our research attempts to find out whether there have

been effects of the program implemented on a number of variables that affected students' performance, thus values below 0.70 are considered acceptable (Hair, Anderson, & Tatham, 1999, p. 638).

Since the size of the groups was different, reflecting the general population (more non-retained than retained subjects), the assumption of independence of observations was checked. To this end, the Z-test (Rachá's test) was conducted with the pre-test observations, and independence was found in all variables, except for the case of "support from father" (Table 2). However, as this variable was not significant in subsequent analyses, it does not affect any of the results.

Procedure

A two-stage cluster sampling method was used. Schools were selected in the first stage and students were selected in the second stage. In both cases, the type of sampling used was non-probability convenience sampling.

For the selection of schools, our team called upon the educational administration to provide data regarding secondary schools supported by public funds, with the largest number of immigrant students. From this point on, each school had to meet two basic requirements: School's and teacher's willingness to cooperate; this teacher should teach one of the selected subjects and two classes of the same year (first or second of CSE), with immigrant-origin students, so that one class could act as a control group, and the other as an experimental group. Since these are natural classroom groups, they were determined according to a random assignment procedure.

The individuals in the sample and their families were informed of the objectives of the study. All of them gave their consent to participate in the study.

Data analysis

In order to analyze the differences between groups, a set of variables was selected, which theoretically and empirically exhibited relevance when achieving good academic performance (Barbero et al., 2007; Dufur et al., 2013; Núñez et al., 2014; Santos Rego, 2012; Valle et al., 2009).

To check the efficacy of the program, a 2x2 (Group x Being Retained) analysis of variance was performed. The pre-treatment scores of the students were taken into account to check whether we were starting from homogeneous groups. No significant differences were observed in any of the variables under study.

Table 1
Reliability indices recorded at the two points of the study

Scale	Variables	Percentage of variance	Pre-test	Post-test
Self-image	Companionship	55.87	.720	.745
	Feedback		.790	.843
	Self-esteem		.670	.605
	Self-efficacy		.770	.759
Satisfaction		63.35	.720	.810
		48.72	.860	.814
Support and control	Father	46.52	.762	.761
	Mother	46.08	.843	.859
Study habits		45.03	.619	.627
Opinion on the school	Other family members	45.09	.814	.822

Table 2
Z-test and associated probability

Variables	Z	p
Companionship	-.58	.583
Feedback	.32	.748
Self-esteem	-1.58	.113
Self-efficacy	-1.36	.173
Satisfaction	1.62	.052
Support and control - father	-2.07	.039
Support and control - mother	-1.08	.281
Support and control - others	-.53	.598
Study habits	.076	.940
Opinion on the school	-1.44	.151

A 2x2x2 Repeated Measures ANOVA was performed (Group × Being Retained × Program) with all the dependent variables.

In all analyses performed, the lost values were not taken into account, as shown in Table 3.

Results

The results are shown below in Table 3. No data concerning the main effect of group are included, because no significant results were obtained in any of the variables analyzed.

Self-Image as a student

In the companionship variable, significant differences arising from the program were found. Subjects show a greater willingness to work in groups after completing the program ($M_{Pre} = 3.91$, $M_{Post} = 4.73$).

Significant differences were also found in the variable referring to feedback from their teachers, this time depending on whether or not students were retained. The non-retained students are those who obtain a higher score ($M_{NR} = 3.70$, $M_R = 3.36$).

Likewise, the fact of being or not being retained introduces significant differences in the self-esteem variable, because the score is higher in non-retained subjects ($M_{NR} = 4.07$, $M_R = 3.68$).

As for self-efficacy, significant differences were found based on whether or not the subjects are retained. The non-retained students are those who obtain a higher score ($M_{NR} = 4.09$, $M_R = 3.52$). On this occasion, the Group × Being Retained interaction was also significant. Table 3 shows that the participants from the experimental group who are not retained obtained a higher mean score, but there are no differences in the control group.

The corresponding *post hoc* analysis found significant differences in the experimental group ($M_{NR} - M_R = -.246$, $p < .01$), that is, non-retained subjects show greater self-efficacy after completing the program. No significant differences were observed in the control group, nor were there significant effects in terms of self-efficacy.

Satisfaction with the subject

There are significant differences in the satisfaction variable, depending on whether or not the subjects are retained. The non-retained subjects obtained a higher score ($M_{NR} = 4.19$, $M_R = 3.87$).

Family support and control

Regarding the support and control variable, a significant effect was only observed in relation to the support and control from

Table 3
Analysis of Variance (ANOVA) with repeated measures for all the dependent variables

Factors	Group ($n_{Exp}=136$, $n_{Con}=108$)	Program		Being retained ($n_{No}=187$, $n_{Yes}=57$)		Interaction	
		M (SD)	F	M (SD)	F	M	F
Companionship		Pre: 3.91 (.72) Post: 4.73 (.85)	$F(1, 242)=276.44, 87***$, $\eta^2 = .553$, $1-\beta = 1.00$				
Feedback				No: 3.70 (.20) Yes: 3.36 (.33)	$F(1, 242) = 9.32**$, $\eta^2 = .038$, $1-\beta = .860$		
Self-esteem				No: 4.07 (.69) Yes: 3.68 (.43)	$F(1, 242) = 13.85***$, $\eta^2 = .057$, $1-\beta = .960$		
Self-efficacy				No: 4.09 (.18) Yes: 3.52 (.30)	$F(1, 242) = 37.77***$, $\eta^2 = .140$, $1-\beta = 1.00$	EG No: 4.12 Yes: 3.77	CG No: 4.00 Yes: 3.42 $F(1, 242) = 5.19**$, $\eta^2 = .022$, $1-\beta = .621$
Satisfaction				No: 4.19 (.57) Yes: 3.87 (.59)	$F(1, 242) = 12.08**$, $\eta^2 = .05$, $1-\beta = .940$		
Support from mother						EG No: 3.64 Yes: 3.35	CG No: 3.46 Yes: 3.56 $F(1, 242) = 3.92**$, $\eta^2 = .017$, $1-\beta = .505$
Study habits		Pre: 2.92 (.54) Post: 3.27 (.79)	$F(1, 242) = 9.64**$, $\eta^2 = .285$, $1-\beta = 1.00$	No: 3.22 (.55) Yes: 2.96 (.56)	$F(1, 242) = 9.16**$, $\eta^2 = .038$, $1-\beta = .854$	EG Pre: 2.94 Post: 3.32	CG Pre: 3.05 Post: 3.36 $F(1, 242) = 3.98**$, $\eta^2 = .071$, $1-\beta = .511$
Opinion		Pre: 3.55 (.65) Post: 3.61 (.67)	$F(1, 242) = 4.89**$, $\eta^2 = .021$, $1-\beta = .596$	No: 3.65 (.60) Yes: 3.37 (.63)	$F(1, 242) = 9.86**$, $\eta^2 = .041$, $1-\beta = .88$	EG Pre: 3.62 Post: 3.74	CG Pre: 3.49 Post: 3.46 $F(1, 242) = 4.06**$, $\eta^2 = .012$, $1-\beta = .383$

Note: * $p < .05$, ** $p < .01$, *** $p < .001$.

the mother, since the Group \times Being Retained interaction was significant. The corresponding *post hoc* analysis found significant differences in the experimental group ($M_{NR} - M_R = .30, p < .01$), that is, the non-retained subjects of this group perceived more support from their mothers after completing the program. No significant differences were observed in the control group, nor were there significant effects in terms of support from their father or other family members.

Study habits

Regarding the habits variable, a significant effect was obtained from the being retained variable ($M_{NR} = 3.22, M_R = 2.96$). Significant effects of the program were also found. The subjects obtained a better score after completing the program ($M_{Pre} = 2.92, M_{Post} = 3.27$). The Group \times Program interaction was equally significant.

The corresponding *post hoc* analysis showed a significant difference arising from the program in the experimental group ($M_{GEpre} - M_{GEpost} = -.87, p < .001$), but not in the control group, indicating that the program has a significant impact on improving study habits.

Opinions on the school

Finally, regarding the opinion variable, a significant effect was obtained depending on whether or not the subject had been retained ($M_{NR} = 3.65, M_R = 3.37$), arising from the program ($M_{Pre} = 3.55, M_{Post} = 3.61$) and the Group \times Program interaction. As in the previous case, the *post hoc* analysis showed a significant difference arising from the program in the experimental group ($M_{GEpre} - M_{GEpost} = -.12, p < .01$), but not in the control group, indicating that the program has a significant impact on improving the participants' opinions about the school involved in the program.

Discussion

The participation of students from compulsory secondary education and their families in the ECO-FA-SE program leads to the following considerations:

- First, the program improves companionship among students, regardless of whether they are retained or not. The research on cooperative learning sets positive interdependence as a key element to its effectiveness (Johnson et al., 2013; Johnson et al., 2014).
- Secondly, non-retained students distance themselves from retained students in the feedback they receive from their teachers (Pekrun, Cusack, Muruyama, Elliot, & Thomas, 2014), and in self-esteem scores, which are differences attributable to the intervention program.
- Thirdly, a number of variables should be emphasized, in which results show that, after implementation, there was a marked increase in the differences between the two groups of students in the experimental group, a consequence attributable to the intervention, and always favoring the non-retained students. More specifically, this refers to the self-efficacy and support and control of their activities from their mother. The family education program had a particular impact on this topic (Santos Rego, Godás, & Lorenzo, 2016). In this vein, Fan and Williams (2010) examined

whether some aspects of parental involvement were related to the motivation of tenth-grade students (commitment, self-efficacy and intrinsic motivation towards mathematics and english). The results showed that the educational aspiration of both parents for their children and their contact with the school had clear positive effects on the aforementioned motivational dimensions (Santos Rego, Godás, & Lorenzo, 2017).

- Fourth, it is clear that the program has a significant impact on improving the opinion of participating non-retained students about school involved in the program and their study habits (Ng, Zakaria, Lai, & Confessore, 2016). It is also the non-retained students who are more satisfied with the subject.

In short, the ECO-FA-SE program improves self-image, satisfaction with the subject, maternal support and control, study habits, and opinion about school; in addition, the effect is significantly greater among non-retained students.

The effectiveness of grade retention of students has been questioned many times, and actually, as it can be observed, it seems that these students' scores in international tests may cast a shadow over the final results of the country. The solution may not be grade retention, but cooperative work between families and school in order to achieve the best results.

In general, differences between both types of students conform to what is already known about the determinants of a good academic achievement (Aronson, 2002; Cordero et al., 2013; Núñez et al., 2014; Santos Rego, Lorenzo, & Priegue, 2009; Santos Rego, 2012). Considering this, after analyzing the results, some general conclusions can be drawn about the effects of the program implemented. The differences between the conditions prior to and post-implementation indicate that there are a number of factors whose presence can only be due to the effects of the implemented program:

- (1) Improvement of study habits in all participating students.
- (2) A better assessment of cooperative teamwork after participating in the program (prior to this, students preferred individual work).
- (3) The effects of the participation of families in a parallel program were noted with regard to paying more attention to their children's education, establishing a regular place of study, supporting them in their school tasks and showing their support with positive feedback about them and their student status.

In short, cooperative work in classrooms and family involvement in education affect variables which research links to improving school performance. It was found that those who most benefit are the students who have not been retained. This should favor the implementation of such programs in primary education.

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